



Tanta University Faculty Of Engineering

Electrical Power and Machines Department

1st Year (Electrical) 2012/2013 *(2nd Term)*

Electrical Circuits (2) *(EPM1203)*

Sheet (4)

Mutually coupled circuits

1. Two magnetically coupled coils have self-inductances of 52 mH and 13 mH, respectively. The mutual inductance between the coils is 19.5 mH
   a) What is the coefficient of coupling?
   b) For these two coils, what is the largest value that *M* can have?
   c) Assume that the physical structure of these coupled coils is such that $\mathcal{P}_1 = \mathcal{P}_2$. What is the turns ratio N_1/N_2?
2. The physical construction of four pairs of magnetically coupled coils is shown in Fig. 1. Assume that the magnetic flux is confined to the core material in each structure. Show the possible locations for the dot markings on each pair of coils

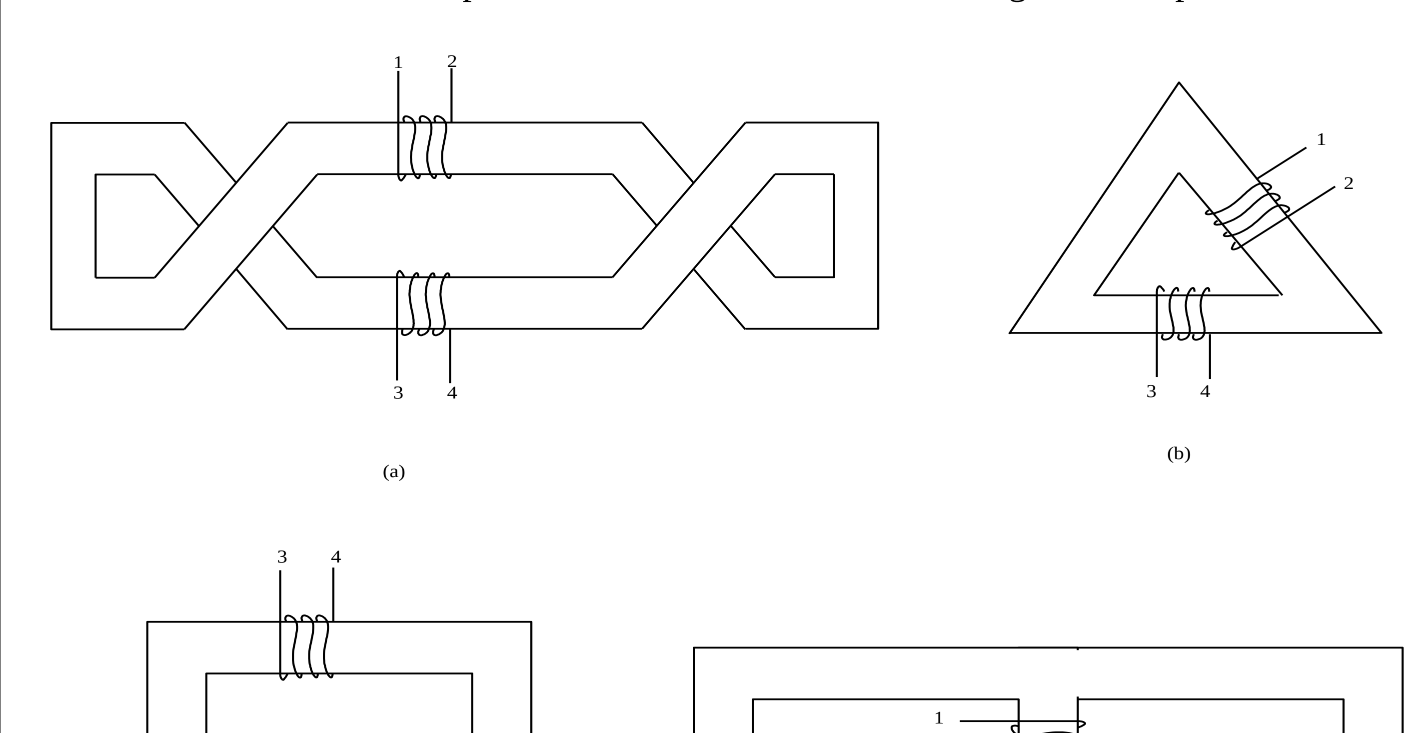


Fig. 1

3. Show that the two coupled coils in Fig. 2 can be replaced by a single coil having an inductance of $L_{ab} = L_1 + L_2 + 2M$. (Hint: Express v_{ab} as a tunction of i_{ab}.)

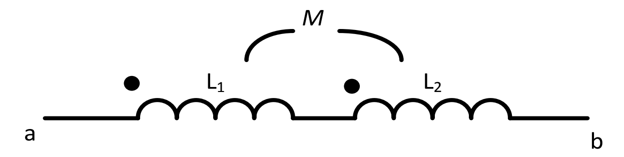


Fig. 2

4. Show that the two coupled coils in Fig. 2 can be replaced by a single coil having an inductance of $L_{ab} = L_1 + L_2 - 2M$. (Hint: Express v_{ab} as a tunction of i_{ab}.)

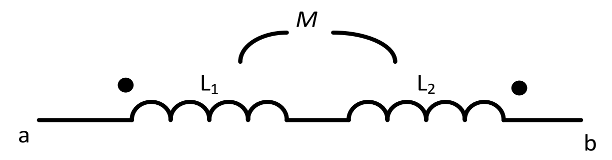


Fig. 3

5. Write down the loop equations for the following circuits

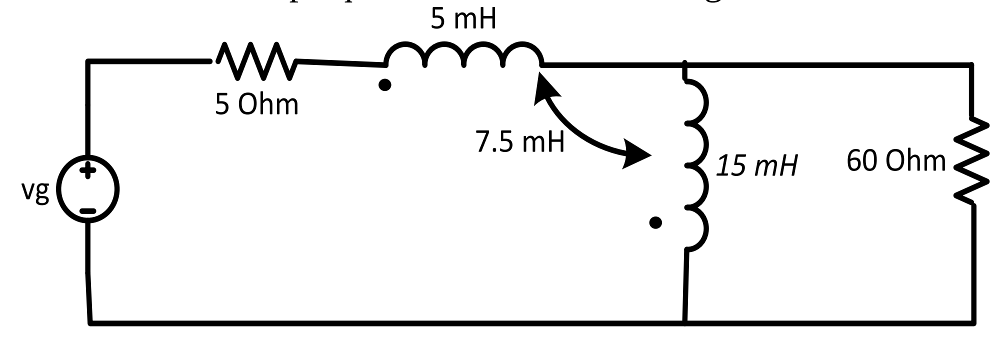


Fig. 4

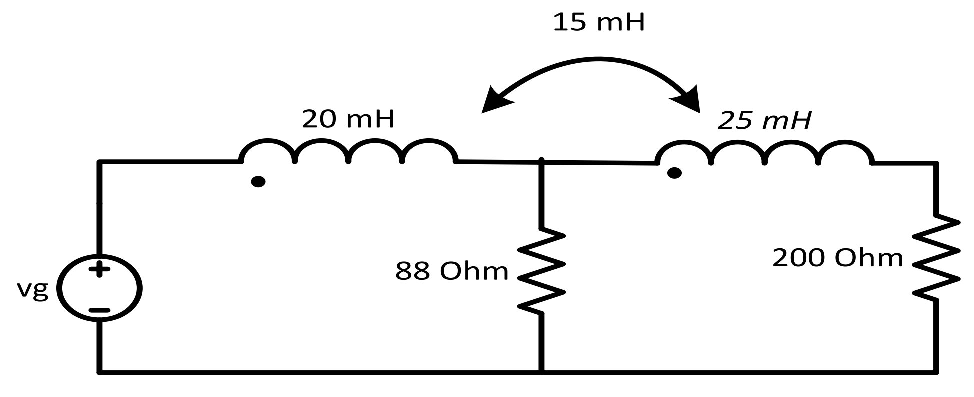


Fig. 5

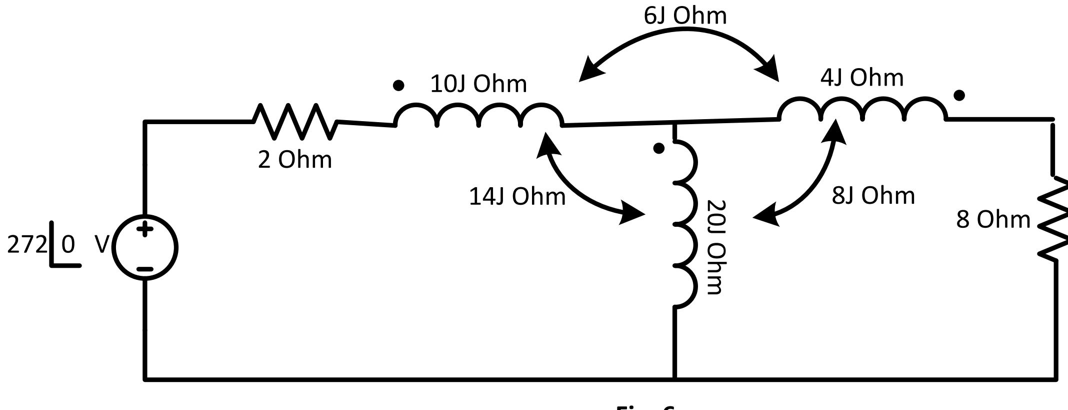


Fig. 6